Shihua Gong: Curriculum Vitae

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Research Interests

Linear and nonlinear solvers; wave propagation; numerical analysis; finite element methods; domain decomposition methods; multigrid methods; nonlinearly preconditioning techniques; cardiovascular fluid-structure interaction; scientific computing and computer simulation

Career and Education

Department of Mathematical Sciences, University of Bath, Bath, UK
Research associate, Mar. 2019 – present, Mentors: Ivan G. Graham and Euan A. Spence
Project: Fast solvers for frequency-domain wave scattering problems

Department of Mathematics, Pennsylvania State University, State College, USA
Postdoctoral scholar, Aug. 2018 - Mar. 2019, Mentor: Jinchao Xu
Project: Discontinuous Galerkin methods for wave equations

Beijing International Center for Mathematical Research, Peking University, Beijing, China
PhD in Computational Mathematics, July 2018, Advisor: Jun Hu and Jinchao Xu
Thesis: Finite element discretization and fast solvers for elastic problems

Sun Yat-sen University, Guangzhou, China
BS in Information and Computational Science, June 2013 Advisor: Ying Jiang
Thesis: Accurate and fast Fourier transformation using non-uniformly sampled data

Academic Visits

Mar. 2-7, 2020	Section de Mathématiques, Université de Genève.	Host: Martin J. Gander
Jan. 26-31, 2020	Depart. of Math. & Stat., University of Strathclyde.	Host: Victorita Dolean
Dec. 15-21, 2019	School of Math. Sci., Peking University.	Host: Shuonan Wu
Dec. 1-12, 2019	Depart. of Math., Chinese University of Hong Kong.	Host: Jun Zou
Nov. 2016 - Sep. 2017	Depart. of Comput. Sci., University of Colorado Boulder.	Host: Xiao-Chuan Cai
Sep. 2015 – Mar. 2016	Depart. of Math., Pennsylvania State University.	Host: Jinchao Xu

Publications

[1] Convergence of parallel overlapping domain decomposition methods for the Helmholtz equation. S. Gong, M. J. Gander, I. G. Graham, D. Lafontaine, E. A. Spence, *arXiv preprint* arXiv:2106.05218 (2021)

[2] A variational interpretation of Restricted Additive Schwarz with impedance transmission condition for the Helmholtz problem. S. Gong, M. J. Gander, I. G. Graham, E. A. Spence, *arXiv preprint* arXiv:2103.11379 (2021).

[3] Domain-decomposition preconditioners for high-order discretizations of the heterogeneous Helmholtz equation. S. Gong, I. G. Graham, E. A. Spence, *IMA Journal of Numerical Analysis*, (2020):1-37.

[4] Helmholtz FEM with low-regularity boundary data: interior estimates and application to analysis of domain decomposition. S. Gong, I. G. Graham, E. A. Spence, in preparation.

[5] New hybridized mixed methods for linear elasticity and optimal multilevel solvers. S. Gong, S. Wu, and J. Xu. *Numerische Mathematik*, 141.2 (2019): 569-604.

[6] A nonlinear elimination preconditioned inexact Newton method for heterogeneous hyperelasticity. S. Gong, X.-C. Cai. *SIAM Journal on Scientific Computing* 41.5 (2019): S390-S408. APA.

[7] Interior penalty mixed finite element methods of any order in any dimension for linear elasticity with strongly symmetric stress tensor. S. Wu, S. Gong, and J. Xu. *Mathematical Models and Methods in Applied Sciences,* 27.14 (2017): 2711-2743.

[8] A nonlinear elimination preconditioned Newton's method with applications in arterial wall simulation. S. Gong, X.-C. Cai. *International Conference on Domain Decomposition Methods.* Springer, 2017.

[9] A mathematical model of aortic aneurysm formation. W. Hao, S. Gong, S. Wu, J. Xu, M. R. Go, A. Friedman, and D. Zhu. *PloS one 12*, No. 2 (2017): e0170807.

Teaching Experiences

1. Tutor, Programming and discrete mathematics, University of Bath, Jan-May 2021
2. Teaching Assistant, Finite Element Methods, Pennsylvania State University, Aug. 2018 - Dec. 2018
3. Teaching Assistant, Introduction to Fluid Mechanics, Peking University, Mar. 2015 - Jul. 2015
4. Teaching Assistant, Functions of Real Variable and Functional Analysis, PKU, Sept. 2014 - Jan. 2015
5. Teaching Assistant, Linear Algebra, Peking University, Mar. 2014 - Jul. 2014

Skills

- **Programming**: Latex, C\C++, Matlab, MPI, Boost, **iFEM**, **FreeFEM++**, **FEniCS**, **PETSc**, Paraview, CMake, Gmesh, CUDA
- **Languages**: Cantonese, Mandarin, English

Presentations

- Contributed talk, SIAM Conference on Computational Science and Engineering, Online, Mar. 2021
- Contributed talk, the 26th International Domain Decomposition Conference, Online, Dec. 2020
- Invited talk, LSEC, CAS, Beijing, Dec. 2019
- Invited talk, CAM seminar, Peking University, Dec. 2019
- Contributed talk, DD26 Satellite Workshop, CUHK, Hong Kong, Dec. 2019
- Contributed talk, Parallel Solution Methods for Systems Arising from PDEs, CIRM, Luminy, Sept. 2019
- Contributed talk, WAVES 2019, TU Wien, Vienna, Aug. 2019
- Contributed talk, 28th Biennial Numerical Analysis Conference, University of Strathclyde, June, 2019
- Invited talk, Bath Numerical Analysis Seminar, University of Bath, Mar. 2019
- Joint Mathematics Meetings: Special Session on Numerical Methods for PDEs, Baltimore, Jan. 2019

- Invited talk, Inverse Problems and Analysis seminar, University of Delaware, Neward, Nov. 2018
- SIAM PP18: Highly Scalable Solvers for Computational PDEs. Waseda University, Tokyo. Mar. 2018
- Invited talk, High Performance Numerical Algorithms and Applications, TSIMF, Sanya, Jan. 2018
- The 15th Annual Meeting of CSIAM, Qindao, Oct. 2017
- Portable, Extensible Toolkit for Scientific Computation Annual Meetings, Boulder, USA, Jun. 2017
- The 18th Copper Mountain Conference on Multigrid Methods, Copper Mountain, USA, Mar. 2017
- The 9th National Finite Element Conference, E'mei, China, Aug. 2016
- The 14th Annual Meeting of CSIAM, Xiantan, Aug.2016
- Invited talk at LSEC, Chinese Academy of Sciences, Beijing, Mar. 2016
- Invited talk, CCMA PDEs and Numerical Methods Seminar, Penn State University, USA, Jan. 2016
- The 8th International Congress on Industrial and Applied Mathematics (ICIAM), Beijing, Aug. 2015

References

Professor Dr. **Xiao-Chuan Cai**
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Professor Dr. **Ivan G. Graham** (Postdoc Mentor)
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Professor Dr. **Jun Hu** (Ph.D. Thesis Advisor)
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Professor Dr. **Euan A. Spence** (Postdoc Mentor)
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